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Governor's STEM Advisory Council Meeting
October 31, 2011 | 8:30 a.m. to 4:30 p.m.
Science Center of Iowa | Des Moines

STEM Literate, STEM Capable and College/Work Ready Graduates for a Competitive Iowa: Some Observations

Jan Morrison
President, TIES

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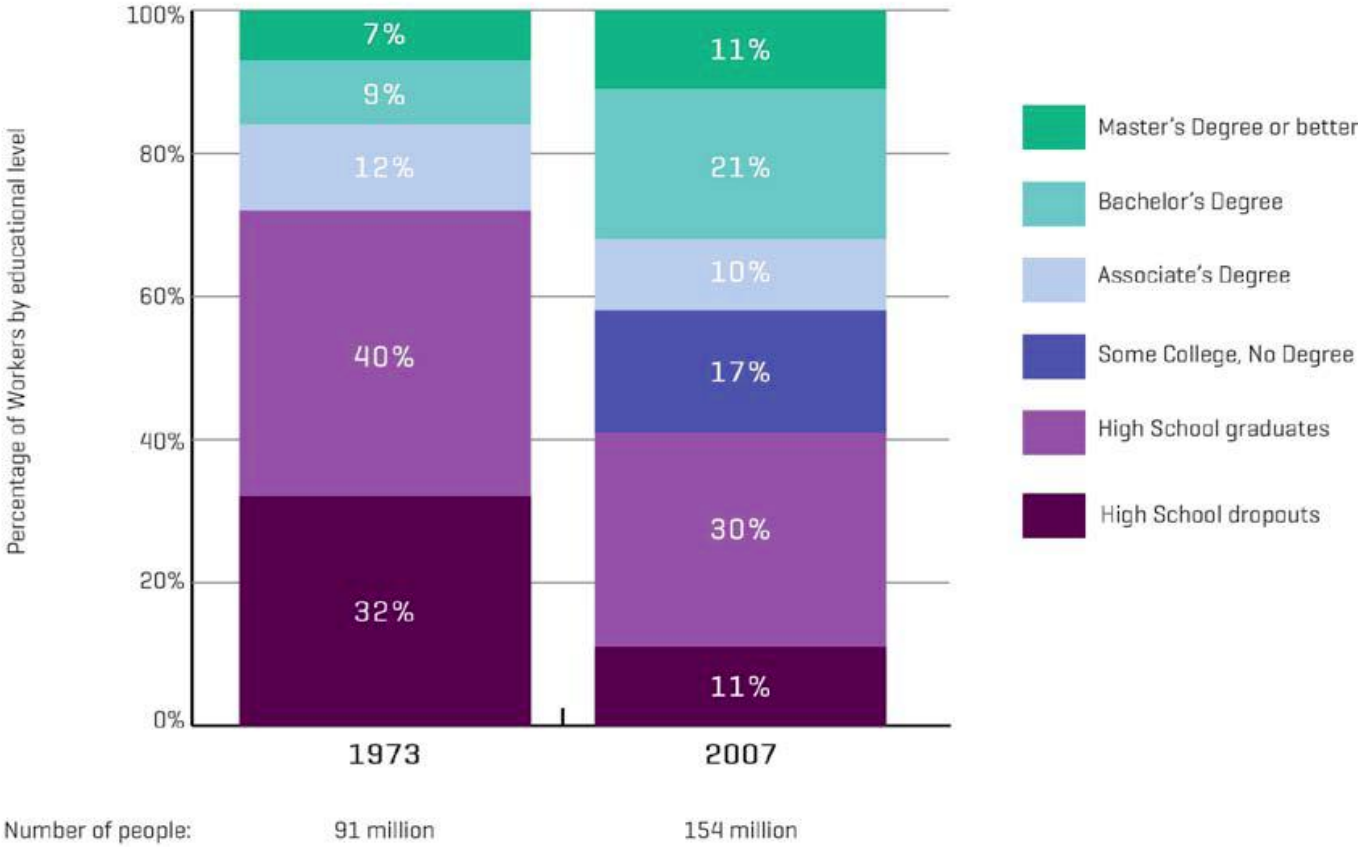
Since 1973, jobs that require at least some college have exploded while opportunities for those with just a high school education have shrunk dramatically



…from the Pathways to Prosperity Project, Harvard University, February 2011

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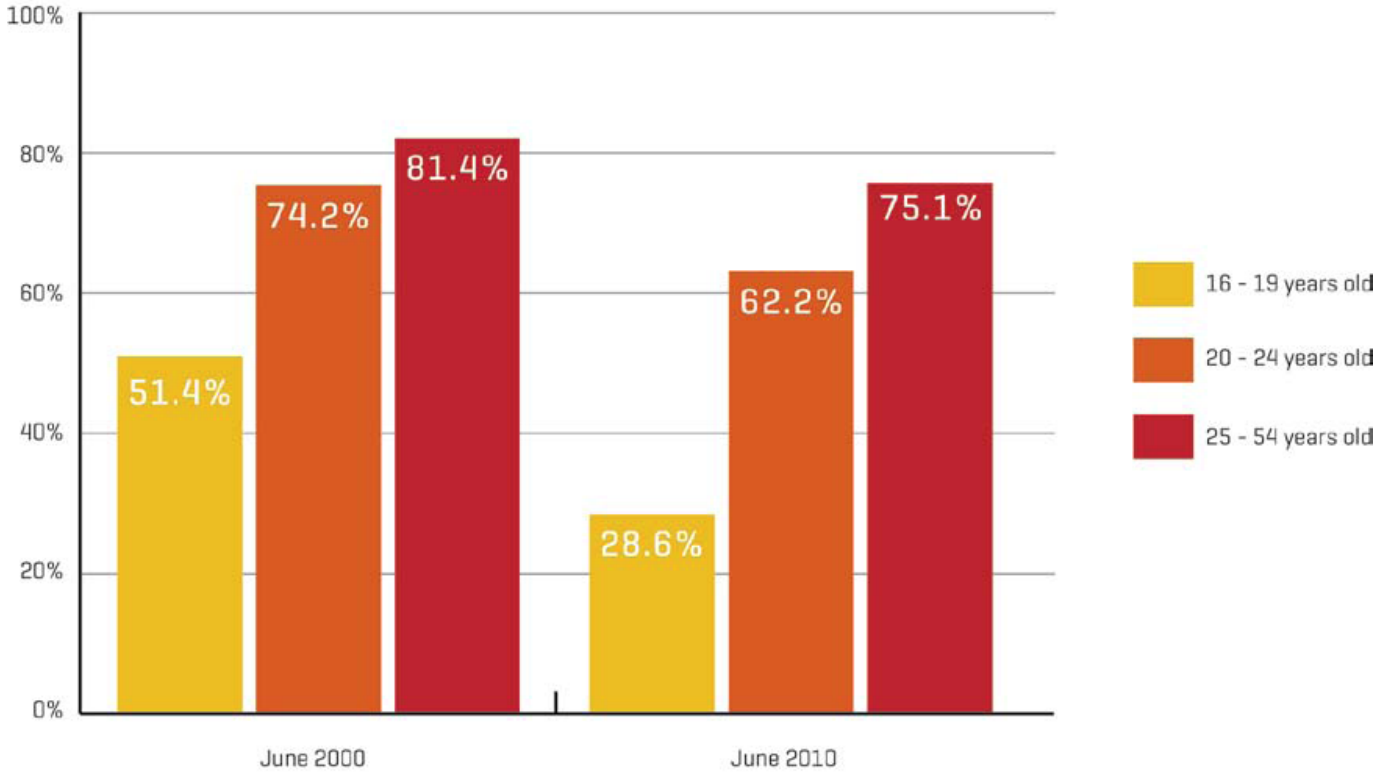
Shrinking employment opportunities: Teens and Young Adults have been hit the hardest bythe Great Recession



…from the Pathways to Prosperity Project, Harvard University, February 2011

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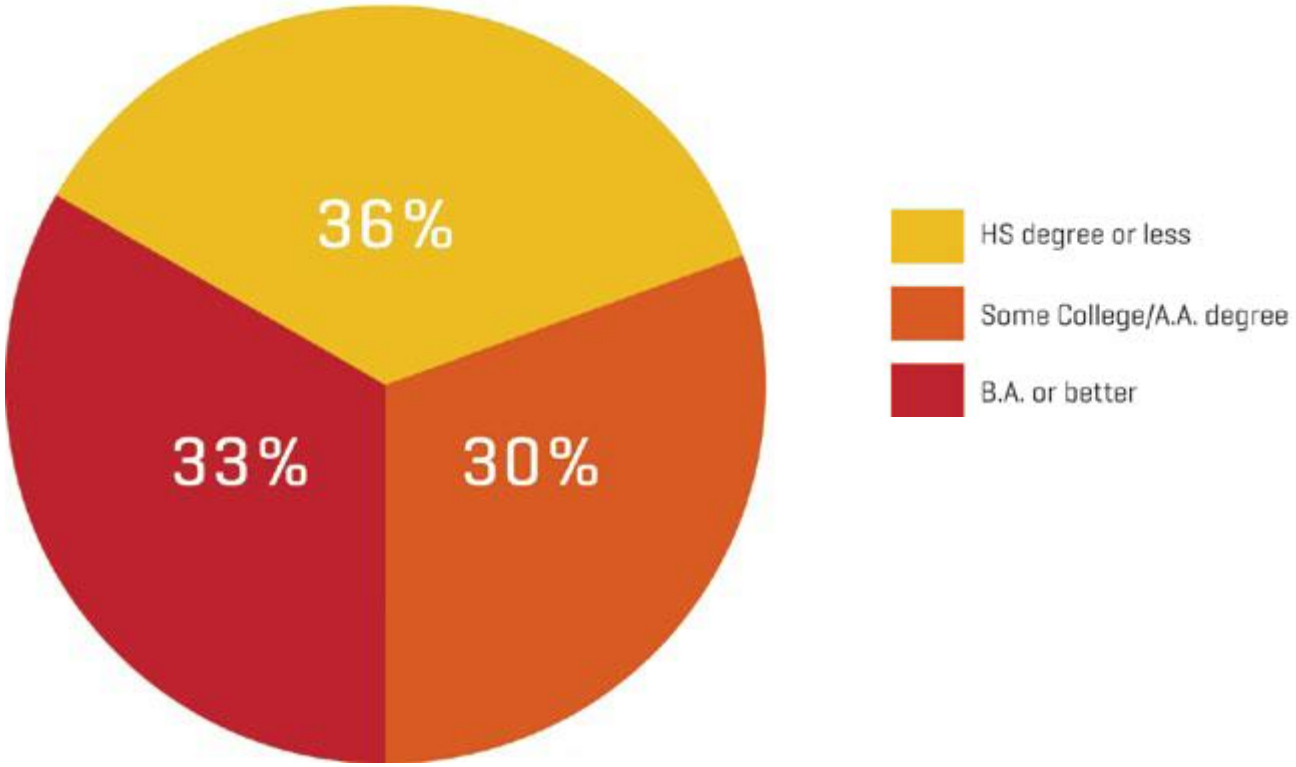
College for All does not mean everyone needs a B.A.
Even in this decade most jobs do not require a B.A.



…from the Pathways to Prosperity Project, Harvard University, February 2011

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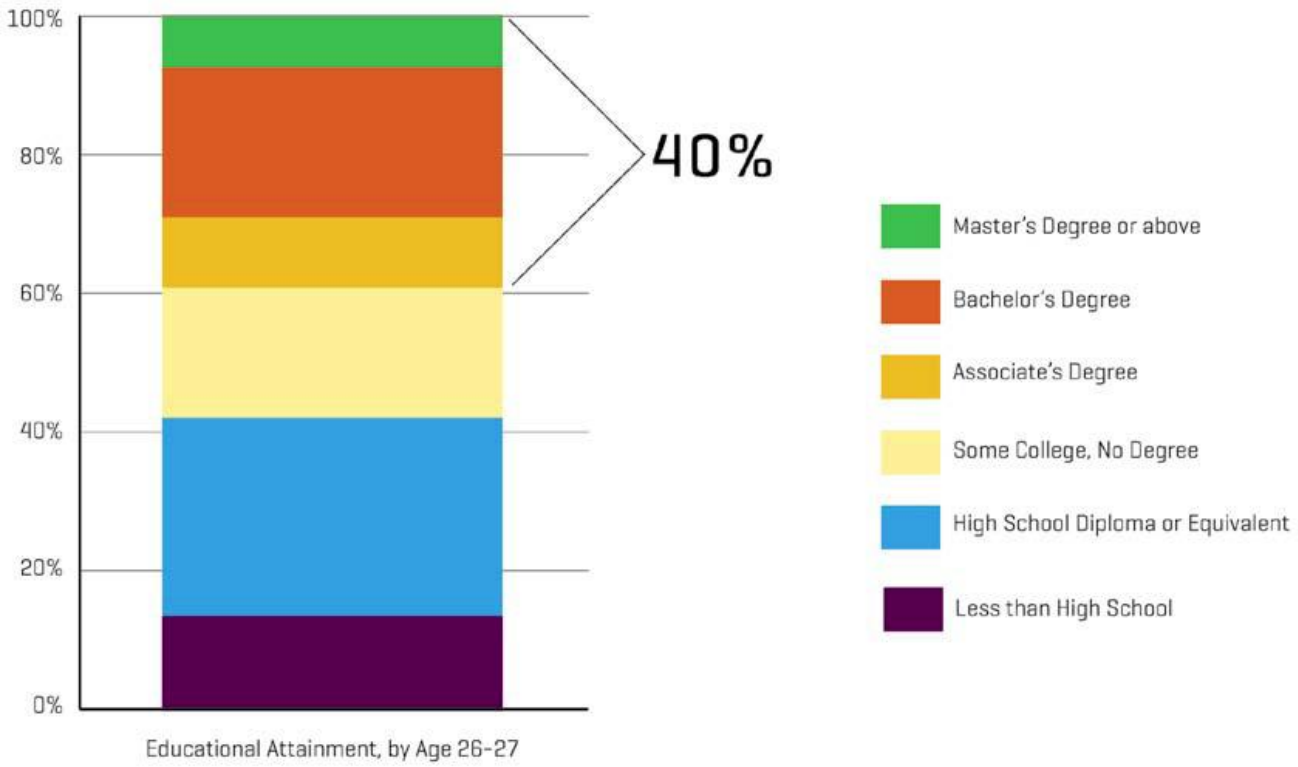
The current US reality: only 40% of 27-year olds have earned an A.A. degree or higher



Note: Represents data collected in surveys between 2006-2008; GED is approximation based on data from GED
Testing Program.
Source: Current Population Survey Annual Social and Economic Supplement.

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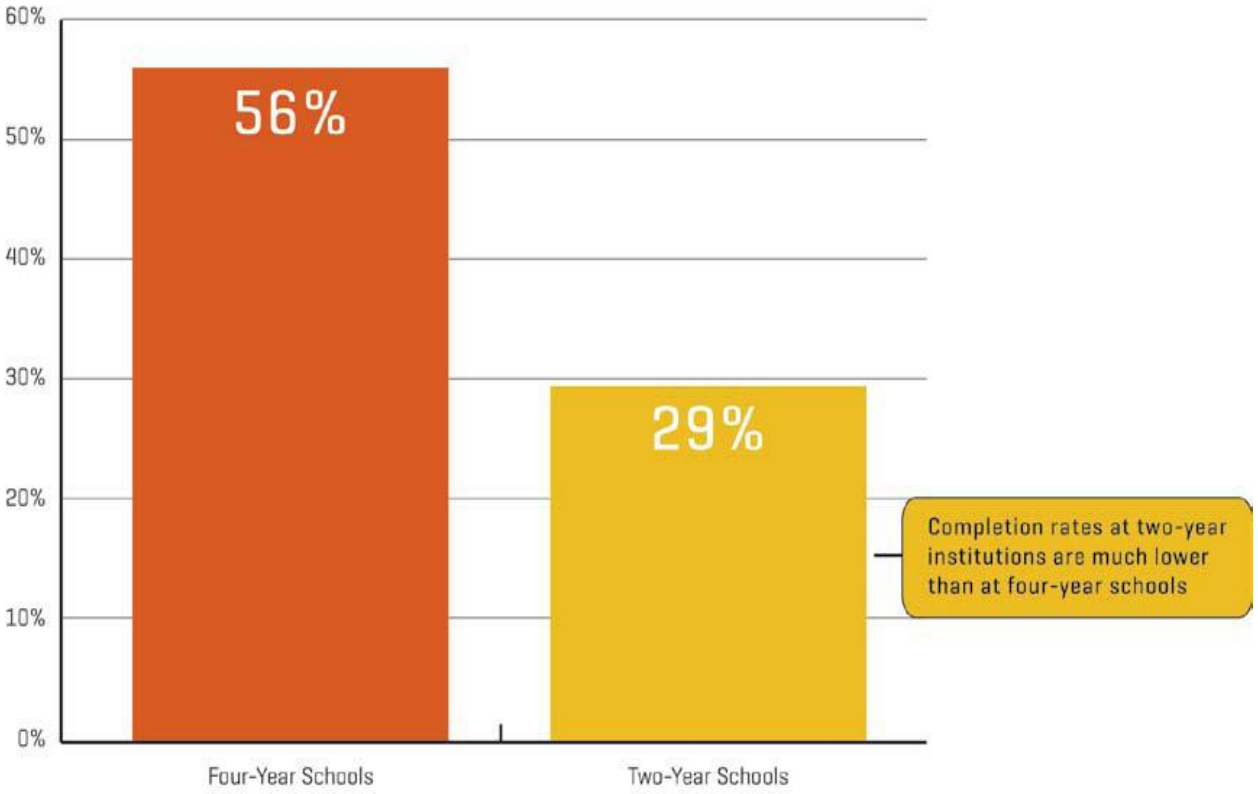
U.S. “on time” college completion rates are alarmingly low



…from the Pathways to Prosperity Project, Harvard University, February 2011

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"Pathways to Prosperity"…An American Solution

Three Key Elements…

The first element is the development of a **broader vision of school reform** that incorporates multiple pathways to carry young people from high school to adulthood

The second is the development of a much **expanded role for employers** in supporting these new pathways.

The third is the development of a **new social compact** between society and its young people

…from the Pathways to Prosperity Project, Harvard University, February 2011

Collaboration is not a natural act.

Enlightened self-interest is.

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Theory of Action:

Scaling Innovation Through Statewide STEM "Managed Networks"

Three key elements…

Investing in key states that can creatively apply their own intellectual and scientific, technical and corporate and financial to leverage and sustain multiple STEM approaches

Connecting these states and other partners through active networking designed to learn, capture and distribute innovation and change behavior

Funding national advocacy through a coalition of outstanding champions that range from corporate executives and political leaders to Nobel Laureates

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What are THE DESIGN PRINCIPLES for the National STEM Mobilization?

An evident focus on STEM content and themes, where students take at least four years of math and four years of science including pre-engineering

An explicit set of core STEM skills, processes, language, critical thinking, design and problem solving that is integrated and reinforced across grades and disciplines

An evident culture that honors STEM and inspires and helps students to pursue it while expressly integrating STEM with humanities and the arts

A formal relationship with local STEM companies, institutions and universities that provide both students and faculty deliberate STEM projects and internships; where they engage with real mathematics, science and engineering

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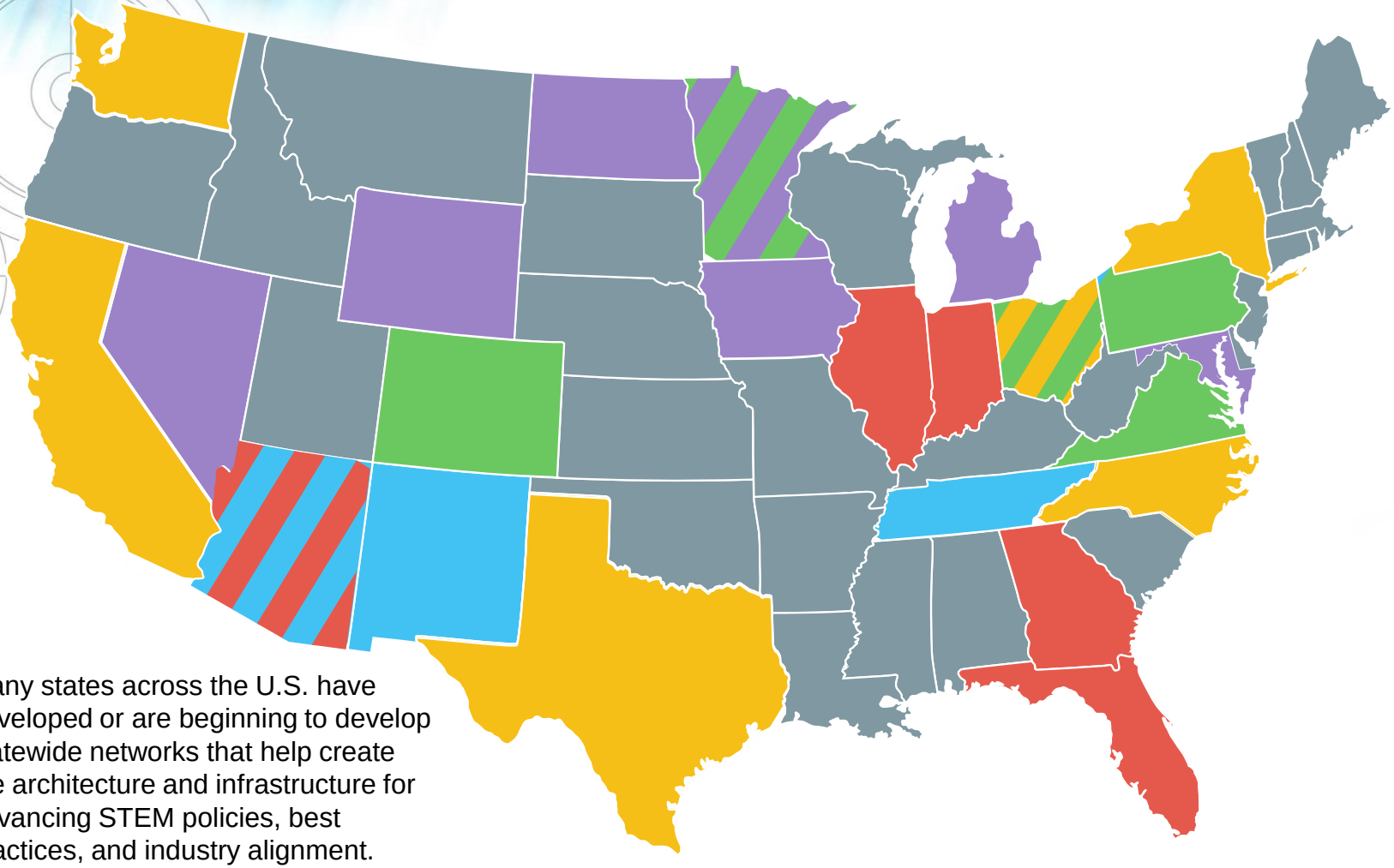
National STEM Network



Many states across the U.S. have developed or are beginning to develop statewide networks that help create the architecture and infrastructure for advancing STEM policies, best practices, and industry alignment.

NGA States | Gates States | Innovate + Educate States | TIES | No Company

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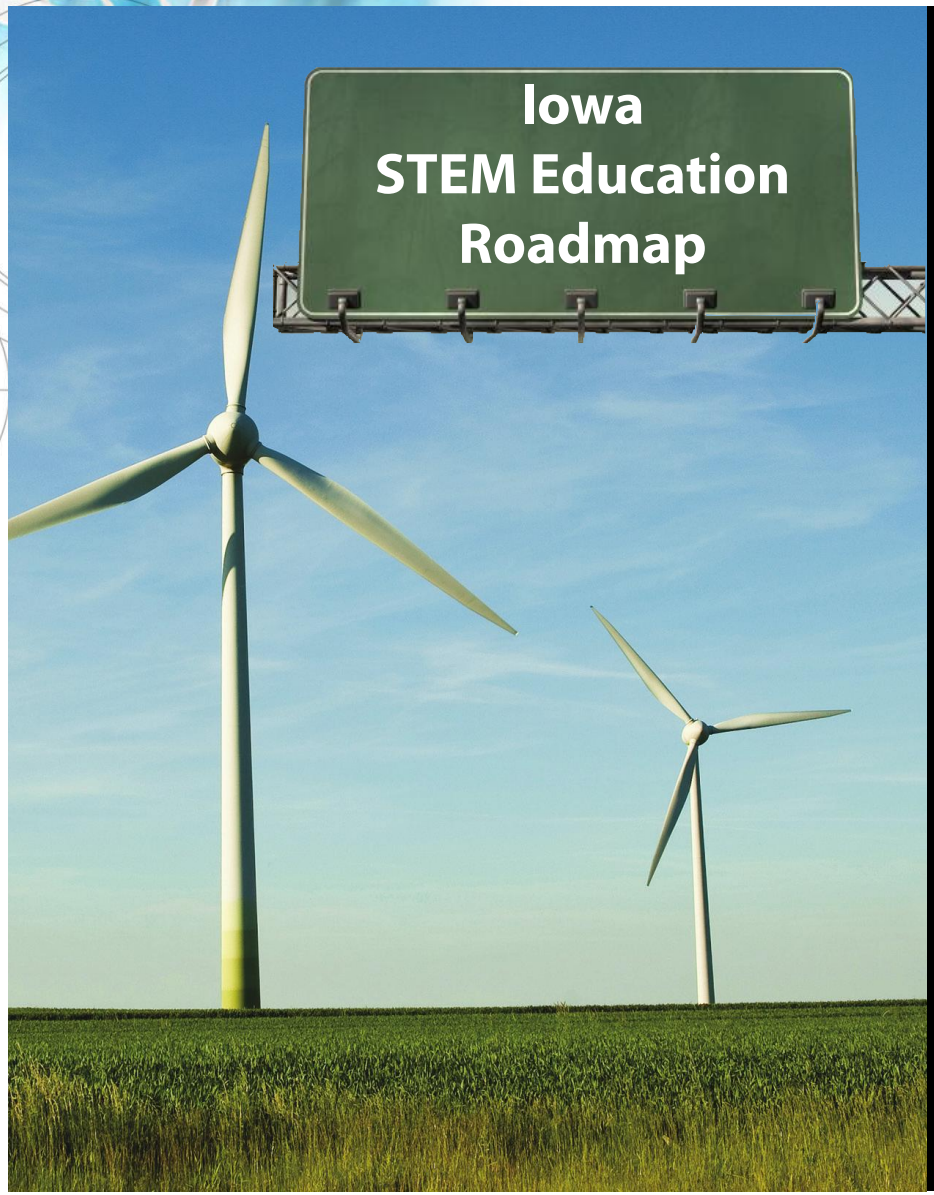

A Strategic Plan for Science, Technology, Engineering and Mathematics (STEM) Education

2011

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Science, Technology, Engineering, Mathematics (STEM) Education: An Iowa Imperative

Targets

Seven major target objectives have been identified by Iowa's STEM education advocates:

Increased interest and performance of Iowa learners in STEM fields

Increased emphasis on STEM fields in Iowa from Pre-K through 20

More high quality STEM teachers prepared by Iowa's institutions of higher education

An Iowa citizenry that recognizes the importance of STEM in leading productive lives and creating/sustaining a vibrant economy

A national leader in STEM workforce preparation and retention in STEM careers

Wide-scale partnership of Iowa's education systems and private enterprise

Coordinated, complementary and uniform STEM education opportunities across Iowa

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Science, Technology, Engineering, Mathematics (STEM) Education: An Iowa Imperative

Where We Stand

Iowa fourth graders were outperformed in mathematics by their peers in six other states on the 2009 National Assessment of Education Progress (NAEP).

Iowa eighth graders were outperformed in science by their peers in seven other states on the 2009 National Assessment of Educational Progress (NAEP).

Fifty (50) percent of Iowa students who took the American College Test (ACT®) in 2009 were not ready for college-level mathematics study, while for science only 37 percent were ready for college level work (ACT®, 2009).

Nationally, fifteen-year-olds in the United States ranked 23rd among developed nations on the science portion of the 2006 Program for International Student Assessment (PISA), and in mathematics they ranked 31st.

Troubling statistics continue to pile on, reminding us that the status quo in STEM (science, technology, engineering, mathematics) education here in Iowa and across America cannot be defended. **STEM fluency is no longer just a worthy "initiative." It is an imperative to stave off the risk of becoming an irrelevant state of a slipping nation.**

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Connecting Iowa's Economic Outlook to Education Opportunities…

Department of Labor TAA Grant Award to Iowa

IOWA

Northeast Iowa Community College

Consortium Leader

Total Consortium Award Amount: $12,695,959

***Consortium members**: Hawkeye Community College, Rochester Technical College, Minnesota State College — Southeast Technical, Riverland Community College, Chippewa Valley Technical College, Southwest Wisconsin Technical College, and Western Technical College*

Bridges 2 Healthcare will implement evidence-based strategies to support the target population of TAA-impacted and other workers in obtaining the necessary knowledge, skills and credentials to achieve well-paying employment. This includes capacity-building efforts to improve and expand curricular offerings online and face-to-face, implement cutting edge advising models, integrate effective bridge program models to support participants, and integrate basic skills instruction with occupational training.

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Engineering Partners in Innovation & Networking

Product Innovation

Content

Informal vs. Formal

Curriculum

Instruction

Process Innovation

Platform Schools

Hub Implementation

Hub Management

In-Residence Programs

Lenses of Innovation

Business Model Innovation

Strategic Partnerships

Shared Funding: People & Services

Blurring Lines (HS / College)

Capacity

Culture

STEM for All

STEM as Context for College Ready

Deep Partner Engagement

Sense of Urgency, Courage, Will

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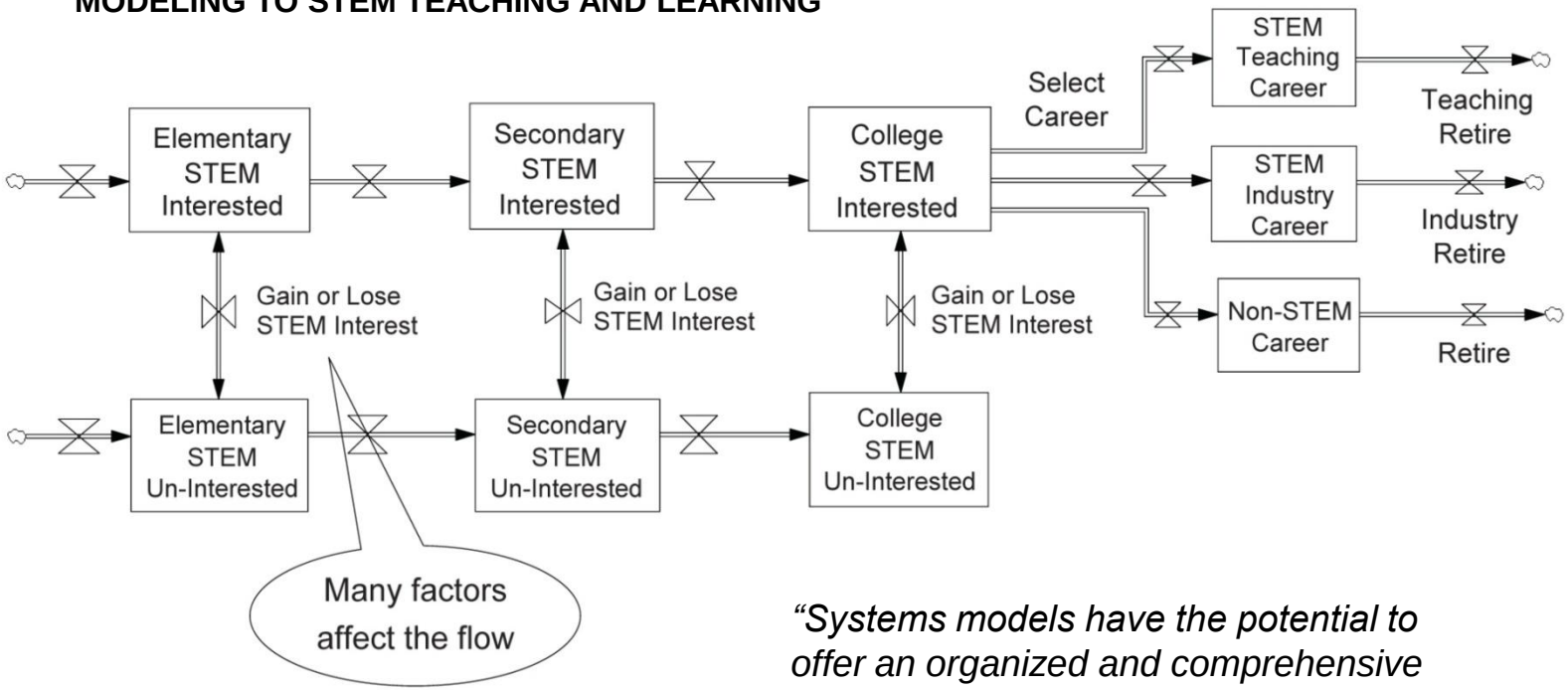
Systems Engineering Informing Public Education

RAYTHEON AND BHEF BRINGING SYSTEMS MODELING TO STEM TEACHING AND LEARNING



"Systems models have the potential to offer an organized and comprehensive approach to understanding the U.S. education system." BHEF 2009

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Applying the Design Process to STEM School and STEM Instructional Program Design

At its heart the design process is a problem solving strategy. It teaches someone how to think critically and carefully through a problem so that at the end of the process a clear, reasoned, and purposeful solution is reached.

Throughout the STEM School and STEM Instructional Program design process you will be utilizing the design process to develop a reasoned, thoughtful and strategic approach to solving to your state's problems. The product you will conceive, develop, and test will be your plan for sustainable innovation.

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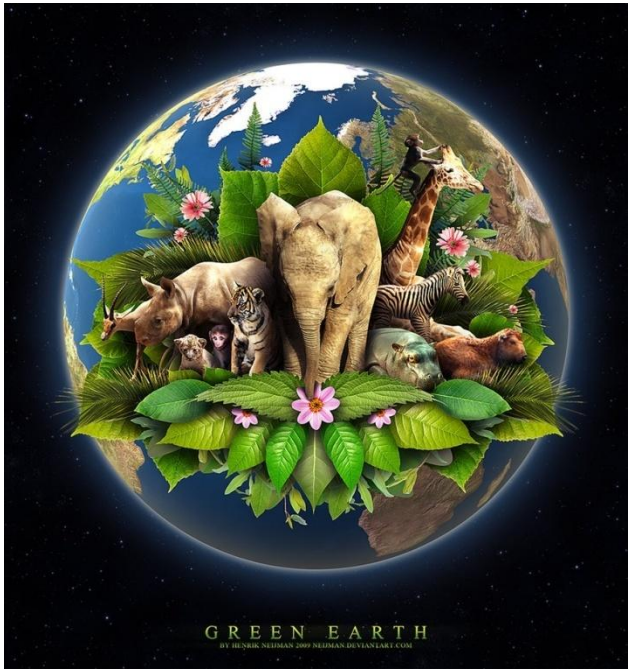
Project-based Learning 2.0 = Design-Focused Learning

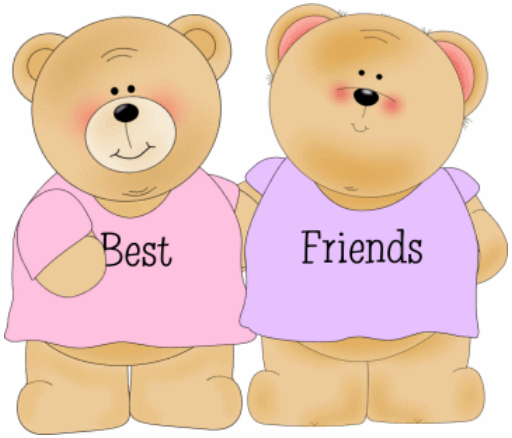
Many schools claim to implement project based learning. What we see in reality is a content-light approach to teaching and learning. We see teacher-made activities and projects pulled from the Internet without reference to research or cognitive science. The projects generally lack coherence too.

We also see teachers tethered to inquiry-based programs – even the best, research-based models – who memorize the mechanics of the curriculum without fully understanding it and/or owning it. Tuesday's lesson becomes activity 23 on p 97 without understanding what activity 23 is and why it matters.

We also see state-of-the-art, fully-wired classrooms with iPads, and Smart boards, and probes…yet the curricula and pedagogical approaches are outdated and pedantic.

Issues that students and all **care about** count…





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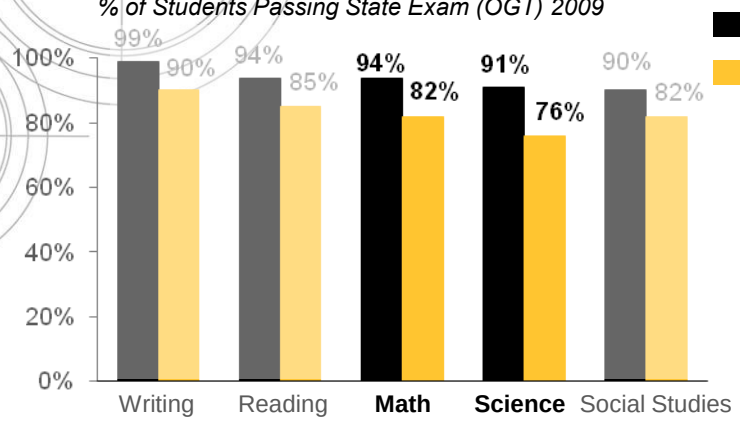
Engineering in Action: MIT Fab Lab in Cleveland

Evidence of Success

College Ready/Work Ready STEM Learning Environments Improved Student Performance

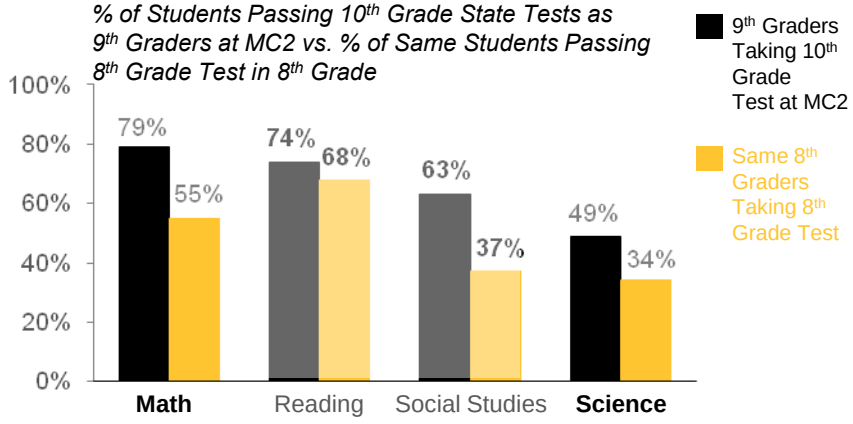
Metro High School, Columbus, OH*

% of Students Passing State Exam (OGT) 2009



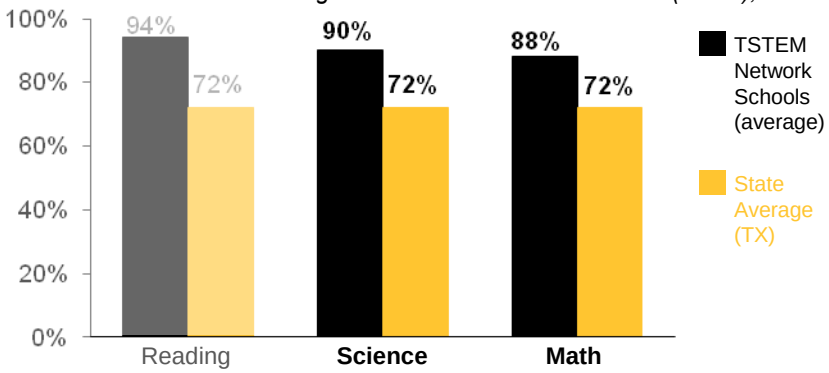
MC²STEM High School, Cleveland, OH

% of Students Passing 10th Grade State Tests as 9th Graders at MC2 vs. % of Same Students Passing 8th Grade Test in 8th Grade



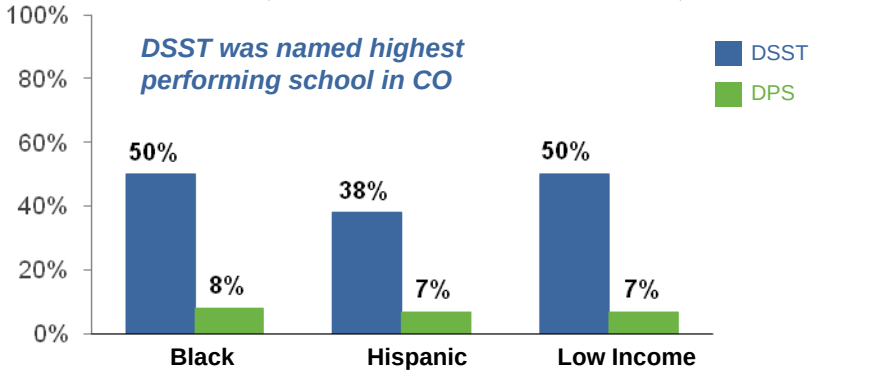
T-STEM Network, Texas

% of Students Passing or Commended on State Exam (TAKS), 2008



Denver School of Science and Technology, CO

10th Grade Math, % of Students Proficient or Advanced, 2008



•% of Metro students taking the test who are free and reduced-lunch is 35%, compared to 24% statewide

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STEHM LEARN and EARN CHALLENGE

Maximize

working and learning student progressing through accelerated, competency-based, flexible pathways.

Double

the number of low-income young adults who, by age 26, earn a postsecondary credential with labor market value.

Learn and Earn Design Principles

"Credits and Dollars"

Strategic Alignment

- Value equally ***learning and working*** relationships that fundamentally change markets, business models and delivery channels.
- Form a single community of practice, PK-20 inclusive of community colleges, a continuous learning labor market, Career Technical Education and identified and driven by industry partners.
- Recognize and leverage 11th/12th grade as a gateway to postsecondary education and employment.
- Form nationally portable, industry-recognized credentials as part of education pathway.
- Synchronizes colleges and employers resulting in structured, clear and flexible credentialing pathways.

Rigor

- Provide academically rigorous, college-ready/ work-ready competency-based curricula that are both scalable and sustainable.
- Drive scalable and sustainable innovation that simultaneously lower recruiting and training costs.
- Anchors in clearly defined learning competencies for acceleration and quality.

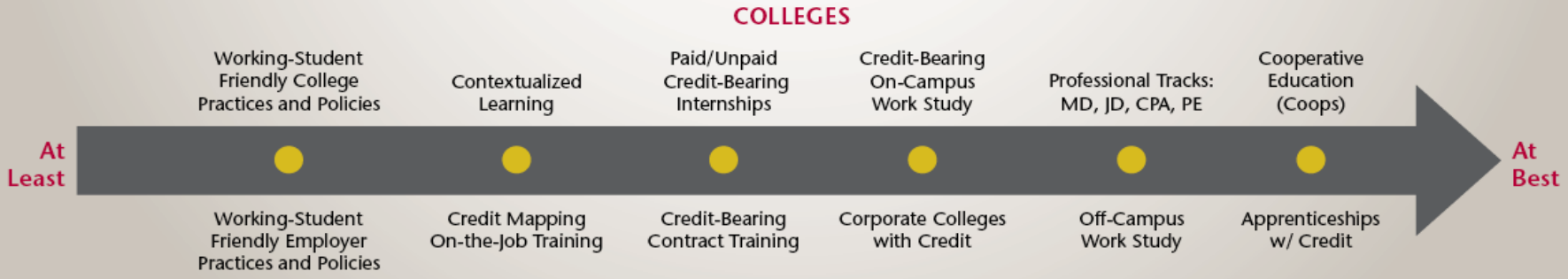
Relevant Work Experiences

- Ground all decisions in "real-time" industry driven-economic focused" data.
- Make STEHM literacy desirable and attainable for all students.
- Accelerates portable career rewards by including interim certificates/certifications that are recognized by employers with wage increases and/or promotions.
- Work experience is both "pay- and credit-worthy.

Financial & Non-Financial Support

- Coordinate resources from government and non-government agencies, education institutions and businesses to support Learn and Earn systems that overcome financial barriers that prevent college-qualified, low-income high school students from participating.

Learn & Earn Continuum Focus: Acceleration, Competency-based, & Flexibility



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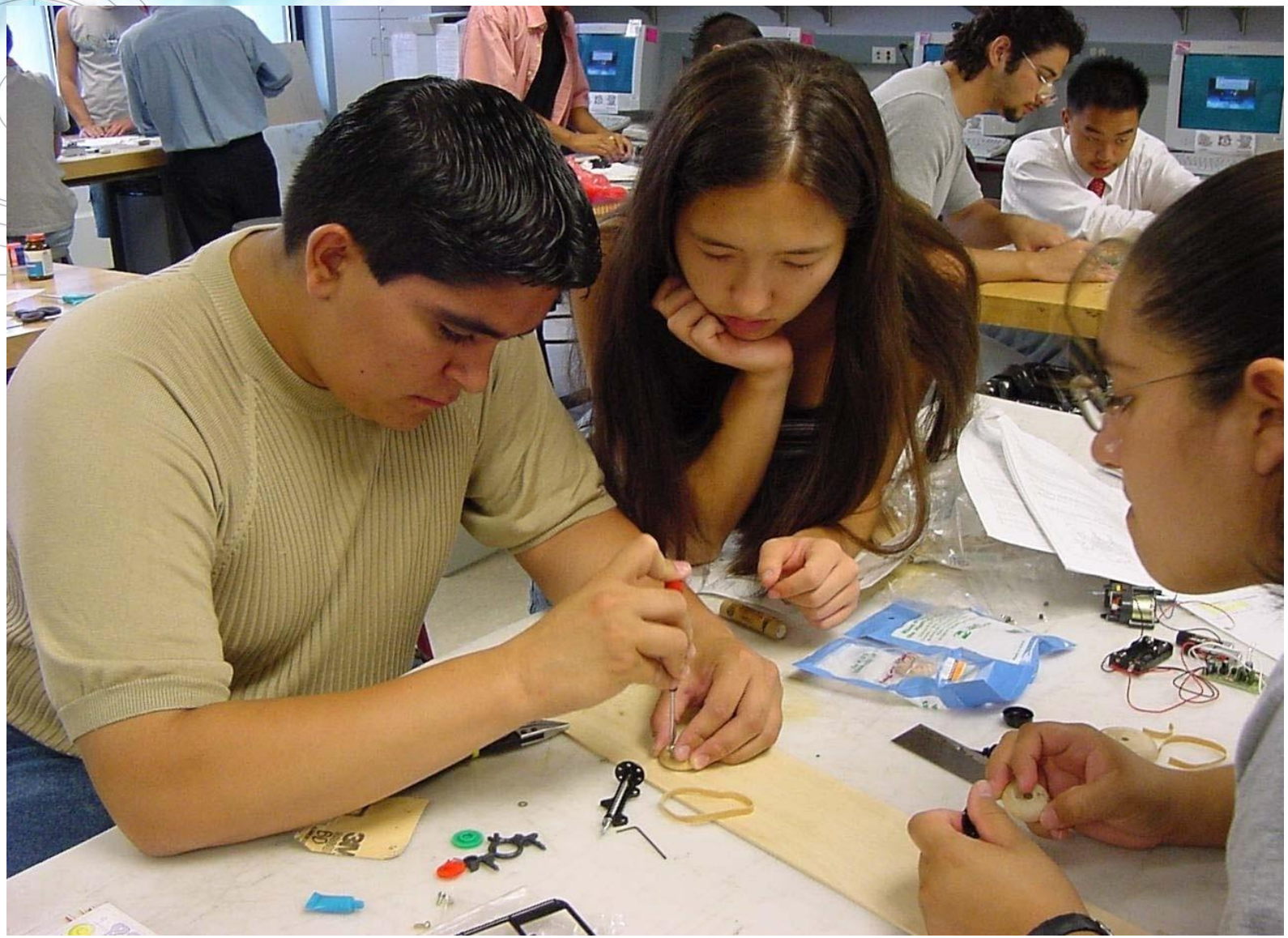

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